Audit Report

OFFICE OF THE INSPECTOR GENERAL

CONTROLLED HUMIDITY PRESERVATION PROGRAM

Report No. 96-151 June 10, 1996

Department of Defense

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Acronyms

CHP	Controlled Humidity Preservation
MATES	Mobility and Training Equipment Site

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

June 10, 1996

MEMORANDUM FOR CHIEF, NATIONAL GUARD BUREAU

SUBJECT: Audit Report on Controlled Humidity Preservation Program
(Report No. 96-151)

We are providing this audit report for information and use. We considered comments on a draft of this report in preparing the final report.

Comments on the draft of this report conformed to the requirements of DoD Directive 7650.3 and left no unresolved issues. Therefore, no additional response is necessary.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. James L. Koloshey, Audit Program Director, at (703) 604-8961 (DSN 664-8961) or Mr. Michael E. Simpson, Audit Project Manager, at (703) 604-8972 (DSN 664-8972). See Appendix C for report distribution. Audit team members are listed inside the back cover.

David K. Steensma

David K. Steensma
Deputy Assistant Inspector General
for Auditing

Office of the Inspector General, DoD

Report No. 96-151 **June 10, 1996**
(Project No. 5AG-0033.01)

Controlled Humidity Preservation Program

Executive Summary

Introduction. The Director of Army Logistics, National Guard Bureau, is responsible for implementing the Controlled Humidity Preservation Program for the Army National Guard. Under this program, equipment will be preserved in controlled humidity shelters for 3-year periods and will not require scheduled maintenance during the 3-year periods. The Controlled Humidity Preservation Program will be tested at six sites for a 1-year period. The exact scope of the program cannot be determined at this time. The National Guard Bureau plans to use controlled humidity preservation to manage the maintenance man-hour backlog within the Army National Guard (estimated to be 4.1 million man-hours) and will use its validation plan as the basis for a Program Objective Memorandum submission.

Audit Objectives. We received a request from the Controlled Humidity Preservation Project Office, Director of Army Logistics, National Guard Bureau, to evaluate the Controlled Humidity Preservation Validation Plan and the applicability of the Controlled Humidity Preservation Program to the Army National Guard.

Audit Results. The National Guard Bureau took aggressive action to implement a Controlled Humidity Preservation Program; however, the validation plan (test plan) was not sufficiently comprehensive to support program goals. The plan did not have measurable objectives, cost collection requirements, a sufficient number of viable alternatives, and an analysis methodology for integrating the various elements of the plan. Consequently, the National Guard Bureau may be unable to support full implementation of the program.

The recommendation in this report, if acted upon, will provide assurance that the National Guard Bureau can support the implementation of the Controlled Humidity Preservation Program. Implementation of this program should produce monetary benefits that cannot be quantified at this time.

Summary of Recommendation. We recommend that the Chief, National Guard Bureau, modify the Validation Plan to include measurable objectives, data collection and analysis, and viable alternatives necessary to support full implementation of the Controlled Humidity Preservation program.

Management Comments. The Chief National Guard Bureau, concurred with the finding and provided a draft test and evaluation master plan with a time line for testing the Controlled Humidity Preservation Program. See Part I for a summary of management comments and Part III for the complete text.

Audit Response. We consider the management comments to be fully responsive and commend the National Guard Bureau for its responsive actions.

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Part I - Audit Results

Audit Background

Relative Humidity and Its Effects. Controlled Humidity Preservation (CHP) is the reduction of moisture from the surrounding air. The percentage of moisture in the surrounding air is known as relative humidity. Relative humidity can be a source of corrosion affecting military equipment. Moisture can also affect the performance of electronic circuitry and computer components now widely used in sophisticated weapon systems.* By removing or controlling the relative humidity or moisture in the air, corrosion of the military equipment and adverse effects on electronic components can be minimized.

Reason for CHP. The Army National Guard will receive about $40 billion of various weapon systems from FYs 1993 through 1996. Assigned manpower for maintenance support for the Army National Guard ranges from about 29 percent to 58 percent of authorized manpower. In an effort to reduce maintenance man-hour costs (maintenance man-hour backlog is estimated to be 4.1 million man-hours) and support these new systems, the Director of Army Logistics, National Guard Bureau, plans to store Army National Guard equipment in controlled environments.

Validation Plan Developed. The National Guard Bureau developed a validation plan or test plan to implement a CHP program within the Army National Guard. The Validation Plan has two storage options: a 3-year or long-term option termed CHP and a short-term option termed Operational Preservation. The Validation Plan specifies a 3-year implementation for the long-term storage option. At that time, 25 percent of the Army National Guards combat equipment at selected test sites would be stored in CHP shelters for 3-year periods. Scheduled maintenance would be waived for equipment in long-term storage. If proven to reduce maintenance costs at the end of a 12-month test period (not yet established), the National Guard Bureau would establish requirements to have 25 percent of all Army National Guard combat equipment in long-term storage.

Program Objective Memorandum Submission. The National Guard Bureau also wants to use the results of the Validation Plan to support a Program Objective Memorandum submission and obtain appropriated funding for implementation of a CHP program throughout the Army National Guard.

Test Sites and Storage Options. Two primary test sites were established in April 1995: Camp Shelby, Mississippi, and Camp Ripley, Minnesota. Since the two primary test sites were established, the National Guard Bureau has selected 11 additional test sites. These additional tests sites are in various stages of site preparation and shelter construction.

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*"Bibliography for the Controlled Humidity Preservation Program," Executive Summary, pg i, Calibre Systems, Inc., January 22, 1995.

Sources of Funding. Since FY 1994, the National Guard Bureau has spent $13.6 million in site preparation and other costs at 13 sites for CHP and Operational Preservation. Sources of funding for this program were reprogrammed Dedicated Procurement Program funds and reprogrammed National Guard Bureau Operation and Maintenance funds.

Audit Objective

We received a request from the National Guard Bureau Project Office for the Controlled Humidity Preservation Program to review the applicability of the CHP Program to the Army National Guard. Specifically, we evaluated whether the Bureau's Validation Plan was adequate to support implementation of the CHP program for the entire Army National Guard. See Appendix A for a discussion of the scope and methodology we used.

Controlled Humidity Preservation

The Controlled Humidity Preservation Program lacked sufficient controls to support program objectives. The CHP Program's validation plan did not establish measurable objectives, did not have adequate maintenance cost collection requirements, and lacked a sufficient number of viable alternatives. Further, the validation plan lacked an analysis methodology for integrating the various elements of the validation plan. As a result, the CHP Program lacks the necessary support to justify full implementation in the Army National Guard.

Guidance

Army Regulation 750-1, "Army Material Maintenance Policy and Retail Maintenance Operations," September 27, 1991, contains several provisions applicable to CHP.

o Chapter 3 states that the maintenance standard will be based on Technical Manual 10 and 20 series for preventive maintenance checks and services. Chapter 3 also states that the maintenance standard is achieved when the condition of the equipment is fully mission-capable.

o Chapter 4 provides the requirements for administrative storage of equipment. Those requirements state that administrative storage will be considered when an entity lacks operating funds, personnel, or other resources to perform maintenance. When placed into administrative storage, all regularly scheduled preventive maintenance services are to be suspended. Further, equipment should meet the requirements of Technical Manual 10 and 20 series before being placed into administrative storage.

Army Regulation 740-3, "Care of Supplies in Storage (COSIS)," February 26, 1993, states when equipment is maintained in an environment that has a relative humidity of less than 50 percent, requirements for most controlled humidity storage are met and inspections should be adjusted accordingly.

The National Guard Bureau has interpreted the requirements of Army Regulation 740-3 and 750-1, Chapters 3 and 4, to mean that preventive maintenance checks and services can be waived when equipment is stored within long-term shelters of the CHP Program.

One tenet of the CHP Program is to place equipment into storage at TM 10 and 20 standards. Equipment can also be placed into the shelters in fully mission-capable standards. The National Guard Bureau will waive preventive maintenance checks and services when combat equipment is in long-term storage.

CHP Program Controls

The CHP Program did not have sufficient controls to ensure program objectives will be met. Specifically, the Mobility and Training Equipment Site (MATES) for the Mississippi Army National Guard did not adhere to verbal agreements for storing equipment in CHP shelters. Equipment earmarked for CHP Program testing was frequently moved into and out of the long-term shelters. If the equipment does not remain inside for the required timeframe, test data would be invalidated and potential cost savings could not be accurately measured. In addition, the Mississippi MATES did not consistently report maintenance man-hours to the National Guard Bureau until January 1996. Although the Minnesota MATES had collected its maintenance man-hours, the data had not been effectively utilized for program validation. We attribute these conditions to an inadequate program validation plan.

Validation Plan

The Validation Plan lacked controls to ensure CHP Program goals could be achieved. Measurable objectives were not clearly stated, data collection requirements had not been established, only two alternatives had been selected for evaluation, and an analysis methodology had not been established.

Measurable Objectives. The Validation Plan proposes goals to achieve a 25- to 50-percent cost avoidance of returning equipment to full mission-capable status, a 3- to 7-percent increase in mission-capable equipment within 24 hours of removal of equipment from CHP long-term storage, and a 10- to 15-percent reduction in resources required for post-storage return of equipment to operational condition; define an optimum relative humidity level for CHP preservation by site and preservation scenario; and establish support requirements to sustain a 95-percent availability rate for equipment in CHP storage. However, the Validation Plan did not clearly state what the measurable objectives would be. Usually, measurable objectives are stated in terms of the criteria to be used in the process, for example:

- o increase in benefits,
- o decrease in actual or allocated costs,
- o increase in effectiveness or readiness,
- o increase in difference or the ratio between benefits and costs,
- o decrease in cost per unit of effectiveness, or
- o maximization of effectiveness or benefit over and above a stated and known baseline.

Data Collection. The Validation Plan had no requirement for MATES to maintain and report maintenance man-hours. The Mississippi MATES stated it had not been asked to forward its maintenance man-hours until January 1996. The maintenance man-hours of the Minnesota MATES were not being properly used as MATES personnel were unsure how to extract their data from the automated system they are using. These cost data are needed to measure the effectiveness of the CHP Program. Without these maintenance man-hours, labor costs and cost savings cannot be calculated and assessed.

Viable Alternatives. Two versions of CHP are discussed in the Validation Plan. One is a long-term storage concept termed CHP. Equipment is placed into a CHP shelter for 3 years where dehumidification of the inside air is maintained between 30 and 40 percent. The other concept is Operational Preservation. Equipment remains outside, ready for use, but connected to air dehydration units for the dehumidification process. Other alternatives were not identified or discussed. To have a valid data base from which to draw conclusions, other alternatives, if available, should also be tested. Examples of other alternatives that could be tested are effects of relief from current maintenance, such as equipment set aside, or effect of placing equipment into a shelter that has no controlled humidity environment but has other protection.

Analysis Methodology. The validation plan did not have an analysis methodology that would include factors such as experimental design, controlled conditions, randomization over variables not controlled, sample size requirements that include statistical precision and confidence, and methods for handling interruptions in the process or loss of sampling units. Consequently, a description of how to proceed from the physical humidity control process to the data gathering, measurement and analysis, and comparison of alternatives for decisionmaking was not included. The validation plan must link effectiveness, benefit, and cost measures with data collection requirements, statistical and economic analysis procedures, and statistical formulas to measurable objectives.

Conclusion

The CHP Validation Plan lacked measurable objectives, had no data collection requirements, did not have a sufficient number of viable alternatives, and lacked an analysis methodology. If the Validation Plan is modified to correct these deficiencies, then a supportable Program Objective Memorandum submission can be developed. To help establish sufficient controls, the IG, DoD, has agreed to provide technical guidance to the National Guard Bureau. Implementation of the CHP program should produce monetary benefits; however, those benefits are not quantifiable at this time. Incorporating the actions detailed in the recommendation should provide the statistical assurance necessary for Validation Plan conclusions.

Recommendation, Management Comments, and Audit Response

We recommend the Chief, National Guard Bureau, modify the Controlled Humidity Preservation Validation Plan to identify the measurable objectives, establish data collection requirements, include a sufficient number of viable alternatives, and establish an analysis methodology.

Management Comments. The National Guard Bureau concurred with the recommendation and stated that the information and facts presented in the audit report were accurate. The National Guard Bureau further stated that implementing the recommendation would vastly improve the Controlled Humidity Preservation Plan and strengthen the overall program. The National Guard Bureau provided a draft validation detailing the requirements for a 1-year test. This plan identified measurable objectives, established data collection requirements, included a sufficient number of viable alternatives, and established an analysis methodology. The draft validation plan is not in this report but can be provided upon request.

Audit Response. The National Guard Bureau comments are fully responsive. We commend the National Guard Bureau for the exceptional response to the recommendation and its development of a test and evaluation master plan. Results of the test and subsequent analysis will occur at the conclusion of the test period, currently planned for June 1997 at five sites (Camp Shelby, Mississippi; Camp Ripley, Minnesota; Western Kentucky Training Site; Redmond, Oregon; and Fort Bliss, Texas) and March 1997 at one site (Fort Stewart, Georgia).

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Part II - Additional Information

Appendix A. Scope and Methodology

Scope

We evaluated the draft Controlled Humidity Preservation Validation Plan (test plan) (undated), as requested by the Director of Army Logistics, National Guard Bureau.

Methodology

This program results audit was made from November 20, 1995, through January 31, 1996, using the auditing standards issued by the Comptroller General of the United States as implemented by the Inspector General, DoD. We had Inspector General, DoD, technical experts evaluate the Controlled Humidity Preservation Validation Plan. We visited the two Controlled Humidity Preservation Program test sites at Camp Shelby, Mississippi, and Camp Ripley, Minnesota. We also visited Fort Indiantown Gap, Pennsylvania, where site preparation had been completed and three CHP shelters were being erected. We interviewed personnel at all three sites and determined whether historical documentation was available to validate the CHP program. Because our scope was limited to evaluation of the CHP Validation Plan, we did not evaluate management controls or rely on computer-processed data to support our results. Appendix B lists the organizations visited or contacted.

Summary of Prior Audit

Inspector General, DoD, Report No. 93-156, "Corrosion Prevention for Wheeled Vehicle Systems," August 13, 1993, stated that wheeled vehicle systems acquired by the U.S. Army showed extensive corrosion early in their life cycles.

The report recommended that the Program Executive Officer, Combat Support, incorporate state-of-the-art corrosion-prevention technology for all future acquisitions and extended service programs of wheeled vehicles. The report also recommended that life-cycle costs be prepared showing the costs of corrosion-related maintenance and repair cost alternatives for all future wheeled vehicle system acquisitions and extended service programs.

As a result of the above recommendations, the Army agreed that all future acquisitions would incorporate state-of-the-art corrosion prevention technology and, where feasible, would use life-cycle cost estimates for corrosion-related maintenance of repair cost alternatives.

Appendix B. Organizations Visited or Contacted

Department of the Army

National Guard Bureau
- Controlled Humidity Preservation Project Office, Director, Army Logistics, Arlington, VA
- Minnesota National Guard Headquarters, St. Paul, MN
  - Camp Ripley, MN
- Mississippi National Guard Headquarters, Jackson, MS
  - Camp Shelby, MS
- Pennsylvania National Guard Headquarters, Fort Indiantown Gap, PA

Non-Defense Agencies

CALIBRE Systems, Inc., Fairfax, VA
Logis-Tech, Inc., Alexandria, VA

Appendix C. Report Distribution

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Assistant to the Secretary of Defense (Reserve Affairs)
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Department of the Army

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U.S. Army Deputy Chief of Staff for Operations and Plans
Commanding General, U.S. Army Forces Command
Commanding General, U.S. Army Materiel Command
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  House Committee on Governmental Reform and Oversight
  House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Governmental Reform and Oversight
  House Committee on National Security
  House Subcommittee on Military Personnel, Committee on National Security
  House Subcommittee on Military Readiness, Committee on National Security

Part III - Management Comments

Departments of the Army and the Air Force National Guard Bureau Comments

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
NATIONAL GUARD BUREAU
111 SOUTH GEORGE MASON DRIVE
ARLINGTON, VA 22204-1382

NGB-ARC-M (36-5d) 21 MAY 1996

MEMORANDUM FOR THE DEPARTMENT OF DEFENSE INSPECTOR GENERAL, 400 ARMY NAVY DRIVE, ARLINGTON, VIRGINIA 22202-2884

SUBJECT: Draft Audit Report on Controlled Humidity Preservation Program (Project No. 5AG-0033.01

1. We reviewed your report and find the information and facts accurate. We concur with the evaluation of the Controlled Humidity Preservation draft Validation Plan. Implementing the recommendations in this report will vastly improve the plan and will strengthen the overall program. The Command response to the report is at enclosure one. A copy of a new draft plan is at enclosure two. *

2. Point of contact for this action is Ms. Pat Condon, NGB-ARC-M, DSN 327-7534, COMM 703-607-7534.

FOR THE CHIEF, NATIONAL GUARD BUREAU:

2 Encls
as

MORGAN F. DENNY
Colonel, GS
Director, Army Comptroller

CF:
NGB-IR

*Not included in this report

20 MAY 1996

ARMY NATIONAL GUARD
COMMAND RESPONSE
TO
DRAFT AUDIT REPORT
OFFICE OF THE INSPECTOR GENERAL, DOD
CONTROLLED HUMIDITY PRESERVATION PROGRAM
PROJECT NO. 5AG-0033.01
22 MARCH 1996

The Army National Guard concurs with the information and facts contained in this report.

RECOMMENDATION: The Chief, National Guard Bureau modified the Controlled Humidity Preservation Validation Plan to identify the measurable objectives, establish data collection requirements, include a sufficient number of viable alternatives, and establish an analysis methodology.

CONCUR, implementing the recommendations will vastly improve the plan and will strengthen the overall program.

a. The validation plan is presently being expanded into a Test and Evaluation Master Plan (TEMP). The TEMP will be finalized by 30 Jun 96; the current draft is enclosed.

b. CHP Program controls will be increased by including site-specific requirements in the TEMP and providing copies to each of the test sites. The issue of maintenance man-hour reports will be resolved by using an automated report format from the Unit Level Logistics System. The report is currently being used to gather data from the FORSCOM Operational Preservation site at Fort Stewart, GA.

c. The TEMP includes measurable objectives, specifically, a comparison of labor man-hours and class IX repair parts costs between the test equipment and similar status quo equipment at each site, by test treatment type.

d. The automated report format referred to in paragraph b above will be used to gather data on specific test equipment at each site. The automation of this task means data will be collected in a uniform manner at each test site.

e. The alternatives under the current TEMP have been expanded from two to six.

f. A very detailed analysis methodology has been developed for the TEMP and is included in the enclosed draft.

ENCL 1

Audit Team Members

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report.

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D. Currently Applicable Classification Level: Unclassified

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